

P1000 Sub-Transmission Service

Link to build thread: [P1K5Dave's Build Thread](#)

[#1](#)

I replaced my reverse and low gears in the sub-transmission this week. It was my first time going through the sub-trans, but I learned a lot that is useful to pass on to anyone getting into this. The first part of this is a guide to removing the sub-trans. You may need to get into it for various reasons, whether replacing your reverse gears, upgrading to Talon reverse gears, replacing your low gear, etc. Whatever you're doing, you'll need new gaskets ready for replacement:

21206-HL4-003	GASKET, SUB-TRANSMISSION CASE
21205-HL4-003	GASKET, SUB-TRANSMISSION COVER

The manual also wants you to have some liquid sealant on hand for re-assembly. They specify TB1207B by Threebond or equivalent. (Manual page 12-7, PDF 377) Also, have a look at your output seals before you order parts. I had oil around my rear output seal, so I ordered and replaced that one. It's not a bad idea to just go ahead and replace both while you're in there if you choose. We'll follow the service manual, but I will attempt to fill in some gaps in the manual, and to let you know what steps are necessary and some that can be [skipped. One](#) of the difficulties of working with the service manual is putting together the order of operations, as it has you jump all around the pages. The first thing I did was to break out all of the steps in order, and I'll list the corresponding manual page (and it's PDF page number, in case you're viewing the manual electronically.) We'll start with the steps to remove the sub-trans. Later, I'll share what I can regarding the internals and reverse gear replacement.

Step	Description	PDF page	Manual page	Comments
1	Remove front seat cushion	82	2-4	
2	Remove rear side cover (gas tank panel)	87	2-9	skipped
3	Remove front seat back	83	2-5	
4	Remove rear center cover (between seat cushion and seat back)	86	2-8	
5	Remove heat shielding (comfort kit)			
6	Remove front doors	96	2-18	skipped
7	Remove front side covers (flares)	91	2-13	skipped
8	Remove floor panel	92	2-14	skipped
9	Remove Air Cleaner Cover	104	2-26	skipped
10	Remove Snorkel Duct A	239	7-17	loosened frame mount only

11	Remove front bumper	93	2-15	May be optional?
12	Remove skid plate	109	2-31	
13	Sub Trans	375	12-5	
14	Drain oil	150	3-16	
15	Disconnect vent line	375	12-5	
16	Remove pinch bolt and shift arm	375	12-5	
17	Remove bolts and stay	375	12-5	
18	Front Differential	375	12-5	
19	Disconnect lock switch	375	12-5	skipped
20	Disconnect front VS sensor	375	12-5	skipped
21	Support front gear case	375	12-5	
22	Remove brackets and bolts	375	12-5	

23	Move front diff forward fully	376	12-6	
24	Disconnect front drive shaft from sub trans	376	12-6	
25	Remove spring and o-ring	376	12-6	
26	On the front of the Sub-Trans	376	12-6	
27	Disconnect vs sensor plug	376	12-6	
28	Release wire clip	376	12-6	
29	release water pump breather hose	376	12-6	
30	Remove bolts, sub-trans position switch, and o-ring	376	12-6	
31	Down below - Remove 3 bolts	376	12-6	

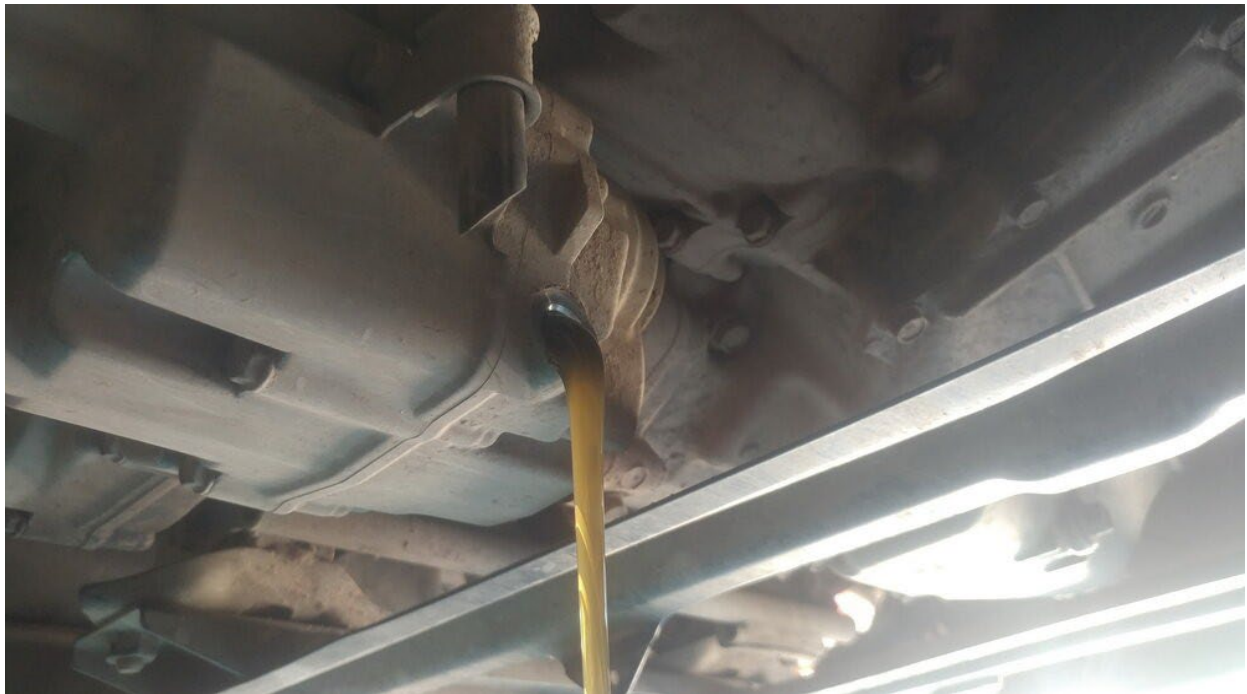
32	Remove two bolts	377	12-7	
33	Remove two acorn nuts and washers	377	12-7	
34	REMOVE SUB-TRANS ASSEMBLY	377	12-7	
35	Remove dowel pins, gasket, and damper	377	12-7	

#2

The first thing you'll notice is the body breakdown before you even get to the drive train. The manual has you taking off a lot more parts than you need to, to get to the sub-trans. I recommend setting yourself up with 4 parts bowls, so you can keep them together by work area. It really helps to make sure you're using all the right parts and not missing anything. Bowl 1: Interior/body nuts, bolts, and rivets to get to the sub-trans. Bowl 2: Bolts, nuts, and such on the sub-trans. Bowl 3: Bumper and Front differential fasteners and brackets Bowl 4: Sub-trans parts when you break it down. Once you get your front seat base and seat back out, you'll remove your rubber comfort kit stuff and the cover that sits between the seat back and bottom. You really don't need to remove the doors and floor to do this job.



Drain the sub-trans oil



I removed my front bumper, but later realized that I only needed to remove the lower portion of my aftermarket Bad Dawg bumper to get to what I needed to work on. It depends on your bumper. You just need access to all the front diff bolts and brackets. Remove the two brackets and long bolts from your front diff, and the long bolt that runs through the rear. Manual page 12-5 (PDF page 375) shows it well. I didn't get pics of all of them, but here's a few for reference





#3

Move your front diff forward as far as it will go, separating the driveshaft from the sub-trans. I didn't need to disconnect any electrical from the differential, as there was plenty of length in the wires to allow it to move forward. Pay attention to the O-ring and spring that are on the shaft. (Edit 4-2021 you probably don't have a spring in here, see later discussion in this thread)



Move your driveshaft to the driver's side, on top of the cooling lines to get it out of the way.

#4

Manual page 12-5 and 12-6 (PDF 375-6) details all the lines and connections that need to be removed from the sub-trans. Wires and vent line are pretty self-explanatory. Here is my shift arm and sub-trans position switch coming off:



#5

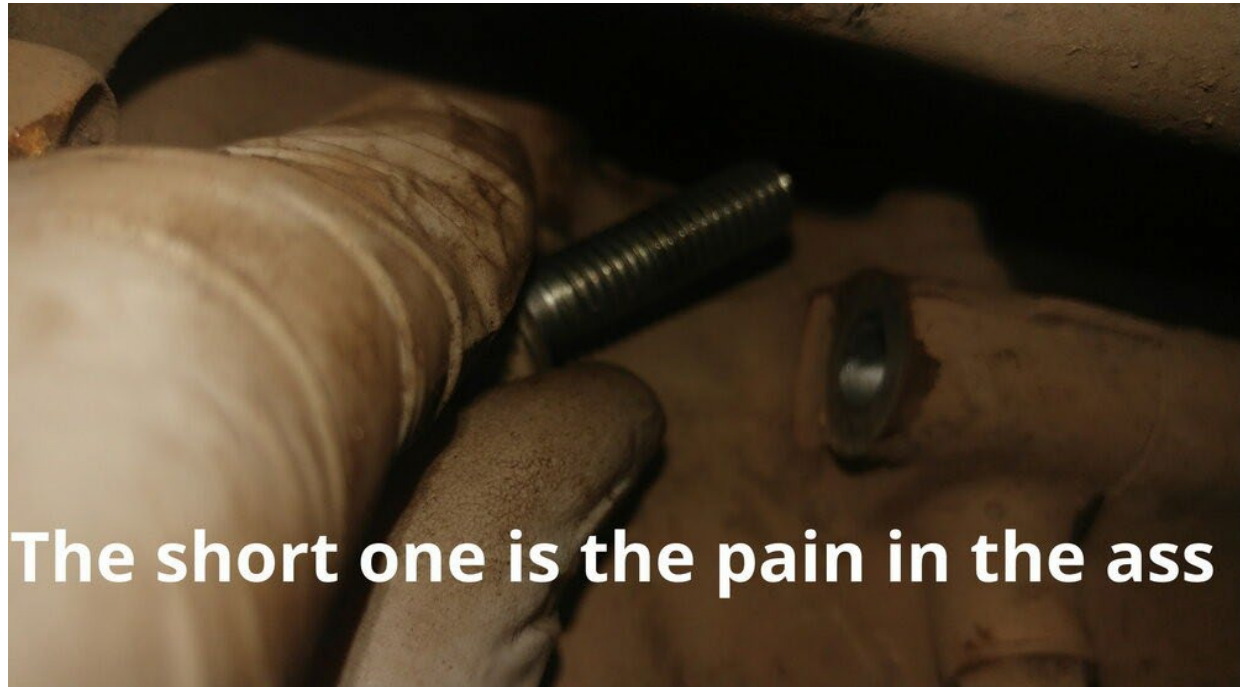


Loosened up the air intake

The manual has you removing snorkel duct A, which is the black plastic air intake tube that runs below your Pioneer. I didn't need to remove it to make room for the sub-trans to come out, but I did need to remove its fastener to the frame, just in front of the sub-trans. This allows you to shift it off to the side an inch or so. Until I did this, the sub-trans would bump into it and wouldn't slide off all the way:

#6

Now you're removing the bolts that hold the sub-trans assembly in the vehicle. I don't think I can improve on the manual here. I did take some pictures, but they don't help provide any context. Page 12-6 (PDF 376) at the bottom has you starting with three bolts. These are accessed from below the vehicle. I'll just say that bolt #1 is a pain in the ass to get to here. I had success using a ratcheting box-end. Have a beer after you get it out.



#7

Accessing from the top, the manual has you removing two more bolts (they're long bolts) and two cap nuts on page 12-7 (PDF 377). After you get these, your sub-trans is ready to be taken out.



#8

I worked from below the vehicle to remove the sub-trans. Wiggling and moving forward, keep it level so you're not stressing the stud bolts that will be left behind. Here's mine starting to separate:



The manual (page 12-7, PDF 377) tells you to collect up your dowel pins, gasket, and drive damper. My drive damper blew up when the sub-trans came out, I don't know why. I had five springs falling out, snap rings, etc. I was able to re-assemble it on the bench, so it turned out OK.

#9

Aaaaaand it's on the bench. Time to crack it open, I did a beer simultaneously. You're on page 12-11 in the manual (PDF 381.)



I tried to clean it up the best I could around the bolts and gasket before I opened it, using compressed air and a toothbrush. You'll be removing the ten bolts holding the cover on, and then tapping on it with a plastic or rubber hammer while separating it. I found I also needed to tap on the output shaft to get it to come free.

[#11](#)

And it's open. Maybe a little hair-raising if it's your first time in here like me.



And here's the rub: I'm not going to be able to help you with every step here, because you may be in here to change out something different than I did. I'll share some info on the reverse stuff, but more importantly - what I learned putting it back together. I didn't take pictures of everything coming apart, because my hands (and brain) were full. You'll need to follow the manual, and when it's not specific enough, try to look at online parts diagrams. I'm going to try and fill in where the manual could have done a lot better, and I'll see if I can include some diagrams to help explain what I'm communicating.

#12

On page 12-11 (PDF 381) it has you removing springs, washers, collars, and control shaft assembly. Pretty straight forward. Page 12-12 (PDF 382) Removing the parking lock lever and return spring is actually optional, if I recall correctly. You can just move it to the side when needed. Removing the drum is documented well. Removing the pivot bolt and stopper arm at the bottom of the page is unnecessary. You'll just be swinging it over during reassembly anyway. Page 12-13 (PDF 383) You're removing all of the gear assemblies. All pretty straight forward. Nothing gets too hairy until you start to break down these assemblies to replace what you need to replace, and then there are a few hitches in re-assembly.

[#13](#)

I replaced the following:

23691-HL6-A00	GEAR, REVERSE DRIVE (25T) (TALON)	1
23701-HL6-A00	GEAR, REVERSE IDLE (16T/22T) (TALON)	1
23650-HL4-000	GEAR, FINAL DRIVE LOW	1
24215-HL4-000	FORK, SUB-GEARSHIFT (RR)	1
23751-HL4-000	SHIFTER, LOW REVERSE	1

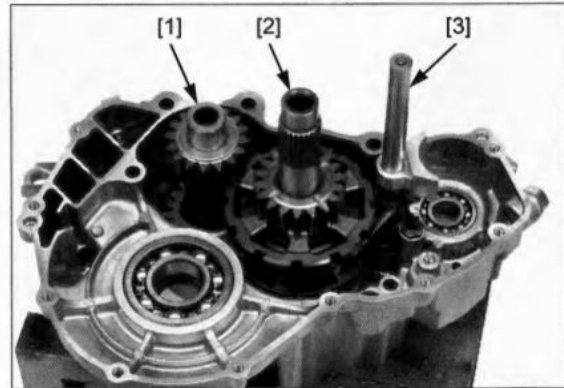
My reverse was fried from the previous owner. Having read other experiences on this forum, I went ahead and ordered the sub-gearshift fork and the low final drive gear because I heard they can be messed up from the reverse getting to the condition this one was in. And I did the Talon reverse upgrade for lower reverse gearing while I had it open. Those are the reverse drive and reverse idle gears, first two in the list.

#14

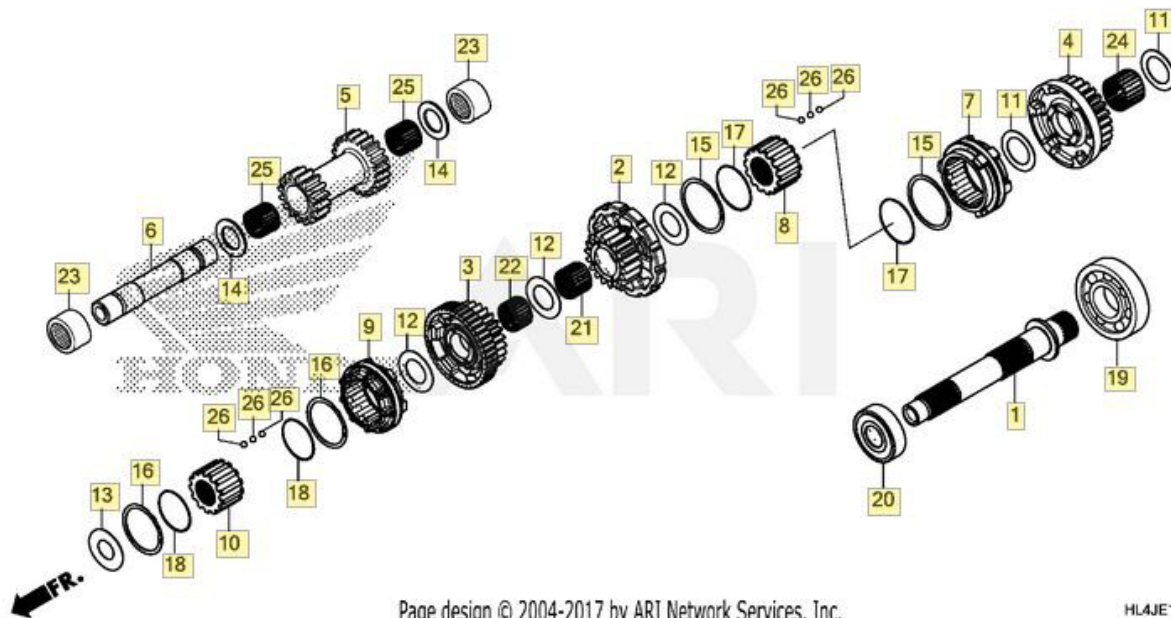
The assemblies I was concerned with to do Talon Reverse, reverse repair and low gear are that group of three you're removing together near the bottom of 12-3 (383 PDF.)

Remove the following together:

- reverse idle shaft assembly [1]
- final drive gear (low gear side)/shaft assembly [2]
- shift fork assembly [3]



Here are #1 and #2 exploded, from the parts diagrams section "FINAL DRIVE SHAFT."



The parts I replaced here are #2,4,5 and 7

Part #	Diagram	Desc
23691-HL6-A00	4	GEAR, REVERSE DRIVE (25T) (TALON)
23701-HL6-A00	5	GEAR, REVERSE IDLE (16T/22T) (TALON)
23650-HL4-000	2	GEAR, FINAL DRIVE LOW
23751-HL4-000	7	SHIFTER, LOW REVERSE

Edit 2021/04/20: Page 12-21 of your service manual also has an exploded diagram of these drive gears, which is quite useful. They also mention keeping the parts in order on a rod or wire, which is a good idea. Then at the bottom of the page, they mention something that I wanted to point out. See those needle bearings (Part #'s 24 and 25?) You may have noticed that they're missing a needle. That kind of spooked me when I first saw it. According to the manual, both have one empty needle slot by design. Curious...

#15

Here's pics of both sides of my Low Reverse Shifter to show you what it looks like when it just makes a chattering noise and doesn't go into reverse:





And the new one with nice clean cogs for comparison:



#16

So, let's talk about that Low Reverse shifter pictured above, Item #7 in the exploded diagram. It has another gear that sits inside it (#8 in the diagram) with snap rings on either side and forty-two little ball bearings the size of BBs in it. When you take it apart, all those BBs fall out. Fortunately, I was working over a pizza box. Have something ready to contain them. There are forty-two of them, and 13 slots. So that's 3 BBs per slot. When you put the new Low Reverse Shifter in, you'll need to swap these internal parts over to it. Put in one snap ring, the inner gear, and then 3 BBs per hole. They'll want to roll over to another hole, and you'll have a hard time keeping track of which slot has how many BBs in it. I used the back of my caliper as a gauge, to make sure I had the same depth all around, verifying that I had 3 BBs in each hole.

#17

From there, swapping out these gears is straight-forward using the exploded diagram. Make sure you get all your stuff in the right order. Then you'll be moving to reassembly, page 12-16 in your manual (PDF 386.) It'll have you doing seal greasing, shaft greasing, all of that. And then on 12-17 (PDF 387) it has you putting the reverse idle shaft assembly, final drive gear / shaft assembly, and shift fork in together. That's right. Together. You'll need to grow a few more hands or something. I was able to work them in together by starting one, then the other, then the other while not letting any of them go all the way in before the other ones. Best I can describe it. Just be patient and they'll come together. Keep following the steps, it's pretty well documented until we get to 12-18 (PDF 388) which I will expand on next.

#18

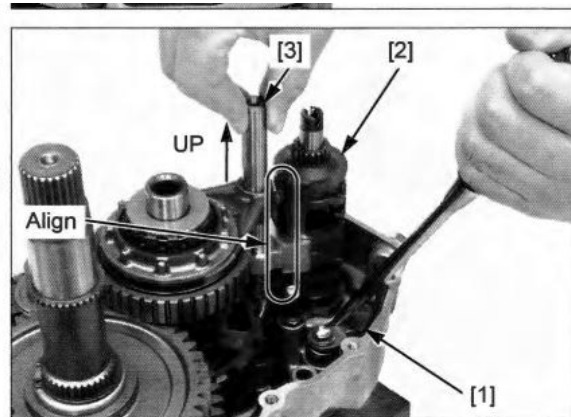
The next place I want to interject is on page 12-18 (PDF 388) second set of instructions, as follows:

Hold the stopper arm [1] with a screwdriver.

Install the shift drum [2] by pulling the shift fork shaft [3] up.

NOTE:

- Align the shift fork bosses with the shift drum groove.



What they're talking about as far as "alignment" there is the straight vertical groove on your shift drum. The straight vertical groove will face toward, and align with, the pins in the shift fork shaft. You'll see what I'm talking about when you're there. Continue following the manual until we get to the top of page 12-19 (PDF 389).

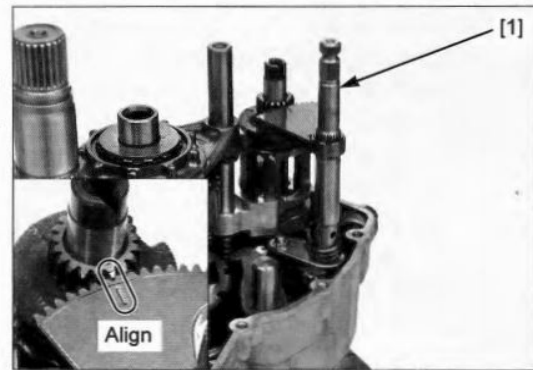
#19

For me, the most confusing part of reassembly comes at the top of page 12-19 (PDF 389) in the Service Manual. It took me a while to figure this out, so hopefully I can save someone the trouble here:

Install the control shaft assembly [1].

NOTE:

- Align the gearshift arm index line with the shift drum white paint gear.
- Make sure that the sub-transmission is in the "N" (neutral) position by rotating the output shaft.

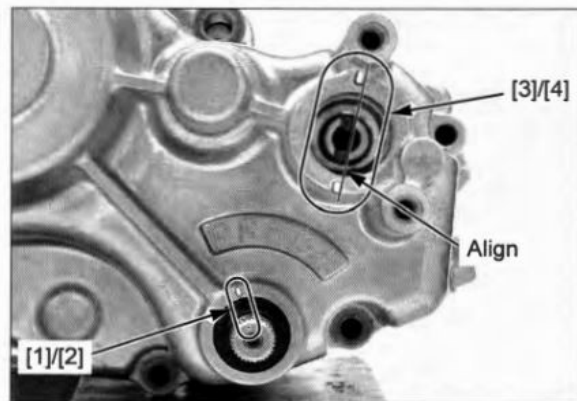


First, there will be no white paint. It's been in a bath of oil, and it's gone. BEFORE you put the gearshift arm in, you'll need to rotate the shift drum 180 degrees, THEN you'll put the gearshift arm in so that the index line points at the center of the gear on the drum. Read that again. Internalize it. This is the step that has tripped up most of the people following the manual. I still don't see where the manual tells me this. it says, "make sure that the sub-transmission is in the "N" position by rotating the output shaft," but I don't know where the "N" position is, nor have they previously referenced the output shaft. I think this is where it's telling you to rotate the shift drum 180 degrees. You'll check this when you slide the cover back on, at the bottom of page 12- 19, as follows. Make sure these line up:

Check the following:

- The punch mark [1] of the control shaft end aligns with the index mark [2] of the case cover.
- The slits [3] of the shift drum aligns with the index marks [4] of the case cover.

The sub-transmission is in the "N" (neutral) position with the above conditions.



Note that now your sub-trans is reassembled in the Neutral position. That means you'll be going to your dash and moving your gear shifter to the Neutral position before you re-attach the shift cable to the sub trans.

#20

All that's left is to put it all back together. My day went surprisingly well until it came to putting the front diff back into its position. Maybe I was getting tired, maybe my luck had run out, but the best advice I can give you for putting the front diff back in is to not tighten anything, not even a little bit, until all three long bolts and both brackets are in place. It gave me a really hard time getting all the hardware in, even with nuts on finger tight. Oh, and then getting the seat back on again. I swear that thing shrunk $\frac{1}{4}$ inch due to the change in temperature between when I took it off and when I put it back on. That's the only explanation I have for it. The five bolts wouldn't line up to save my ass. But that's another story...Other than that, this guide is a wrap. If I remember anything I'm missing, I'll come back and make edits. It has been five days between doing the work and writing this up, so it's possible I could be off somewhere. Anyone who has experience with this, that wants to add more detail or fix anything I may have messed up, please share and I will update the guide! Thanks to all of the members that have put up guides to help me through things. I hope my contribution pays a little back.

#21

Here's a video that represents how shot my reverse was. It's a Talon, but same thing, same sound.

<https://youtu.be/W9pH4VY8aG0>

 <https://youtu.be/W9pH4VY8aG0>

22

Q: Any special tools needed?

A: No, I didn't need anything special. The most useful tool that comes to mind was a ratcheting box end wrench to get at those difficult sub trans mounting bolts.

23

Q: In the service manual, page 12-20 says "Tighten the bolts securely". This is ambiguous. I would think there should be a torque spec for the case bolts which secure the cover side, gasket, and case side together. However, I can only find torque specs for the mounting bolts which secure the sub transmission assembly to the crank case assembly.

Sub transmission Mounting Bolt (cover side = 20 ft lbs.)

Sub transmission Mounting Bolt (case side = 21 ft lbs.)

The case bolts and the mounting bolts will both compress the gasket(s) and assume tightness should be evenly applied.

Therefore, is it correct to assume 20ft lbs. for the sub trans case bolts?

A: I remember coming up on that question myself, I think we discussed it in some other thread because they didn't give me a spec. It seems I recall they had a "general" torque spec based on bolt size that you were to apply absent specific instructions.

I just went with "tightened" by a ¼ inch drive ratchet that wouldn't let me twist anything off but allowed me to get them pretty snug. I'm sure you'll be fine with the 20 ft lbs. if it felt good on the hand-torque test.

As with any cover and gasket, the most important part is working side to side, tightening bolts across from one another a bit at a time until it's all snug and even.

